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HISTORIC AMERICAN ENGINEERING RECORD

MASTER PROJECT RECORD

HI-1

R.W. Meyer Sugar Mill, 1878  
Northeast of Kualapuu off State Route 47  
Molokai  
Hawaii

NOTE: All photographs were taken by Rick Regan during the summer of 1978. The photocopies were made by Rick Regan during the summer of 1978 from originals in the files of the Hawaiian Sugar Planters Association, Honolulu, Hawaii.

- HI-I-1. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill: one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: Historical view, 1934, from T.T. Waterman collection, Hawaiian Sugar Planters' Association. Large rectangular piece lying in front of the mill is the top of the mill frame appearing in its proper place in 1928 views.
- HI-I-2. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill, one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: Top roll and one bottom roll, mill housing or cheeks, and spur pinion gears. The broken projection on the mill beside the bottom roll indicates the location of the cane tray. The cane juice crushed from the cane flowed into the juice tray below the bottom rolls. It then flowed into a wooden gutter and through a short tunnel in the mill's masonry enclosure and on to the boiling house for further processing. The opening at the base of the masonry wall (in the photograph) is where the gutter ran from the mill to the boiling house.
- HI-I-3. RW Meyer Sugar Mill: 1876-1889. Sorghum pan and boiling range flue. Manufactured by John Nott & Co., Honolulu, Hawaii, 1878. View: South side of sorghum pan and boiling range flue. In the sorghum pan heat was applied to the cane juice to clarify it, evaporate its water content, and concentrate the sugar crystals. Hot gasses moved through the flue underneath the entire copper bottom of the sorghum pan from the furnace (east) end to the smokestack (west) end of the boiling range. The sorghum pan sides are of redwood. The flue is built of fire-brick, masonry, and portland cement.
- HI-I-4. RW Meyer Sugar Mill: 1876-1889. Furnace door for sugar boiling range. Manufactured by Honolulu Iron Works, Honolulu, 1879. Cost: \$15.30. View: the furnace for the sugar boiling range was stoked from outside of the east wall of the boiling house.
- HI-I-5. RW Meyer Sugar Mill: 1876-1889. Two sugar coolers ca. 1880. View: After the concentrated syrup flowed out of the sorghum pan, it cooled and crystallized in these iron sugar coolers. After the sugar syrup was granulated and cooled it was dug out of the coolers and fed into the centrifugals. The Meyer Mill purchased twelve coolers between 1878 and 1881 costing between \$35 and \$45 each.
- HI-I-6. RW Meyer Sugar Mill: 1876-1889. Scale for weighing sugar prior to shipping.
- HI-I-7. RW Meyer Sugar Mill: 1876-1889. Engine and boiler house, ca. 1881. Simple, single-cylinder, horizontal, reciprocating steam engine, model No. 1, 5" x 10", 6 hp, 175 rpm. Manufactured by Ames Iron Works, Oswego, New York, 1879. View: Historical view, 1934, from T.T. Waterman collection, Hawaiian Sugar Planters' Association. View shows interior of engine and boiler house intact. The steam-feed pipe is still attached to throttle valve, not the case in 1978 view.

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- I- 8. RW Meyer Sugar Mill: 1876-1889. Simple, single-cylinder, horizontal, reciprocating steam engine, model No. 1, 5" x 10", 6 hp, 175 rpm. Manufactured by Ames Iron Works, Oswego, New York, 1879. View: Steam engine powered the mill's centrifugals. It received steam from the locomotive type, fire-tube portable boiler in the background. The engine's water pump which pumped water from the feed-water clarifying cistern, in between the boiler and engine, through a pre-heat system and on to the boiler, is seen in front of the fluted cylinder. The fly-ball governor, missing its balls, the steam port, and manual throttle valve are above and behind the cylinder. The flywheel, drive shaft, and pulley are on the left side of the engine bed.
- HI-1-9. RW Meyer Sugar Mill: 1876-1889. Locomotive-type, fire-tube, portable boiler, No. 1 model. Manufactured by Ames Iron Works, Oswego, New York, 1879. 120 lbs/sq. inch working pressure, 66 sq. ft. heating surface in tubes. View: from side. The boiler provided steam for steam engine which in turn powered the mill's centrifugals. The section on the left side included the firebox with its surrounding water-legs. The fluted chimney-type structure is the steam port, safety valve, and whistle. Column projecting from side was part of steam pressure and water gauge. Pipe running above boiler carried steam to the engine. Pipe running below boiler provided the boiler feed-water. Cylindrical section included 22 fire-tube surrounded by water. The far right section, to the right of the line of rivets, is the smoke-chamber. Above the smoke-chamber rose the chimney, the base of which is in view. The two brackets on the top of the boiler were made to accomodate the steam engine which, in the Meyer mill, was installed separately.
- HI-1-10. RW Meyer Sugar Mill: 1876-1889. Simple, single-cylinder, horizontal, reciprocating steam engine, model No. 1, 5" x 10", 6 hp, 175 rpm. Manufactured by Ames Iron Works, Oswego, New York, 1879. View: Steam engine powered the mill's centrifugals. To the left of the horizontal (fluted) cylinder is the water pump which moved the boiler feed water through the engine's pre-heat system (the exhaust steam heated the boiler feedwater before it was pumped on to the boiler). The steam-feed port, manual throttle valve, and fly-ball governor and pulley and to the right of the cylinder. The drive shaft with flywheel to the left and pulley to the right are seen behind the piston rod, cross-head, wrist pen, connecting rod and the slide valve and eccentric.
- HI-1-11. RW Meyer Sugar Mill: 1876-1889. Locomotive-type, fire-tube, portable boiler, model No. 1, Manufactured by Ames Iron Works, Oswego, New York, 1879. 120 lbs./sq. in. working pressure, 66 sq. ft. heating surface in tubes. View: the boiler provided steam for steam engine which in turn powered the centrifugals. View shows front fire box, end of boiler. Below fire-box, used for removing ashes, is a door. Circular openings at the rear of the fire-box are where fire-tubes connected with furnace. Column to right of fire-box carried pressure and water level gauges. Fluted chimney-type structure is steam-port, safety valve, and whistle. Weights originally sat on the arm extending from the top of the port and controlled the boiler pressure.

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- HI-1- 12. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill: one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: Historical view, 1934, T.T. Waterman Collection, Hawaiian Sugar Planters' Association, Oahu, Hawaii. Masonry-lined passageway leading to the mill at the center of its circular masonry enclosure. The passageway permitted cane to be carried to the mill and cane trash (bagasse) to be carried away after milling. Bridges over the passageways, not in place, permitted the mill animals to circle and power the mill from above. View shows area prior to substantial overgrowth existing in 1978 views of the area.
- HI-1-13. RW Meyer Sugar Mill: 1876-1889. Engine and boiler house, ca. 1881. Locomotive-type, fire-tube, portable boiler, no. 1 model. Manufactured by Ames Iron Works, Oswego, New York, 1879. 120 lbs./sq. in. working pressure, 66 sq. ft. heating surface in tubes. View: Historical view, 1934, from T.T. Waterman Collection, Hawaiian Sugar Planters' Association. View shows engine and boiler house structure intact. The water and pressure gauge to the right of the boiler are in more complete condition than in 1978 views.
- HI-1-14. RW Meyer Sugar Mill: 1876-1889. Sorghum Pan. Manufactured by John Nott & Co., Honolulu, Hawaii, 1878. View: In the sorghum pan, heat was applied to the cane juice to clarify it, evaporate its water content, and concentrate the sugar crystals. The pan was set on a slope so that the juice would move through the compartments by gravity. The hand-lever sluice valves in the partition walls between the compartments permitted the sugar boiler to regulate the movement of batches of cane juice flowing through the pan. The metal fins projecting from the bottom of the pan imparted a circuitous route to the juice as it flowed through the pan--this made it flow over a much greater heated surface. The fins also supplemented the pan's heating surface by conducting heat into the juice. View is looking west from furnace end of boiling range.
- HI-1-15. RW Meyer Sugar Mill: 1876-1889. Sorghum pan and boiling range flue. Manufactured by John Nott & Co., Honolulu, Hawaii, 1878. View: North side of sorghum pan and boiling range flue, with furnace-end in background. In the sorghum pan heat was applied to the cane juice to clarify it, evaporate its water content, and concentrate the sugar crystals. Hot gasses moved through the flue underneath the entire copper bottom of the sorghum pan from the furnace end (in background) to the smokestack end (in foreground). After the hot cane juice moved through the separate compartments until it reached the final compartment (now missing two sides) where it was drawn out from the copper lip in the corner.
- HI-1-16. RW Meyer Sugar Mill: 1876-1889. Boiling House Interior, 1878. View: Looking from west to east through boiling house. The sorghum pan is on the right. The beams, joists, and trusses are of northwest pine; side boards are of redwood. A foundation line of a loading dock and smokestack are in the foreground. Both end walls have deteriorated completely.

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- HI-1-17. RW Meyer Sugar Mill: 1876-1889. Boiling House, 1878. View: Southwest corner of boiling house. The animal-powered cane mill is located in the undergrowth in the right foreground,
- HI-1-18. RW Meyer Sugar Mill: 1876-1889. Boiling House Interior, 1878. View: Detail of floor with molasses pits below floor level. The remaining floor boards indicate the structure of the floor covering the entire inside of the boiling house. In the left background the base of the centrifugals are in view.
- HI-1-19. RW Meyer Sugar: 1876-1889. Cooling Shed Interior, 1881. View: Looking toward west end of cooling shed. After the concentrated syrup flowed out of the sorghum pan it cooled and crystallized in large sugar coolers. The humidity and vapors caused by the sorghum pan would have retarded the crystallizing and cooling of the sugar in the boiling house. In 1881 this shed was constructed to house the coolers and the sugar before it was dried in the centrifugals.
- HI-1-20. RW Meyer Sugar Mill: 1876-1889. Boiling House Interior, 1878. View: Remains of south wall. The molasses storage pits are below the floor in the foreground. The remaining piece of floor indicates the form of the entire floor. The sorghum pan and boiling range flue slope from left to right (east to west) and permitted batches of cane juice to flow through the boiling pan by gravity. The beams, joists, truss work are built of northwest pine. The sides and floor boards are built of redwood. The boiling range flue is built of fire-brick, masonry, and portland cement. The corrugated roof appears to be a later addition, not contemporary with mill operation.
- HI-1-21. RW Meyer Sugar Mill: 1876-1889. Simple, single-cylinder, horizontal, reciprocating steam engine, model no. 1, 5" x 10", 6 hp, 175 rpm. Manufactured by Ames Iron Works, Oswego, New York, 1879. View: Steam engine powered the mill's centrifugals. Steam-feed pipe at top left of engine. Steam exhaust pipe leaves base of engine on right end and projects upwards. The boiler feed and supply pipe running water through the engine's pre-heat system are seen running to the lower left end of the engine. Pulley in the foreground was not used. The centrifugals were powered by a belt running from the flywheel in the background. Ball-type governor and pulley are on left end of the engine.
- HI-1-22. RW Meyer Sugar Mill: 1876-1889. Sorghum Pan. Manufactured by John Nott & Co., Honolulu, Hawaii, 1878. View: Historical view, 1934, T.T. Waterman Collection, Hawaiian Sugar Planters' Association, Oahu, Hawaii. View looking toward east end of sorghum pan and interior of east end of the boiling house. Walls and final compartment of the sorghum pan are still intact.
- HI-1-23. RW Meyer Sugar Mill: 1876-1889. Boiling House Interior, 1878. View: North Wall of boiling house. In the original structure the three windows on the right admitted light and air from the outside. A shed occupied the left side of the wall outside (hence no windows). In 1881 the construction of the cooling

shed closed in the right three windows. The sorghum is in the foreground. The centrifugals are in the left rear.

- HI-1-24. RW Meyer Sugar Mill: 1876-1889. Centrifugal inner basket, 1879. Manufacturer, unknown. Supplied by Honolulu Iron Works, Honolulu, Hawaii, 1879. View: After sugar was granulated and cooled it was dried and drained, completely separating the sugar crystals from the molasses, in the centrifugal. Revolving at 1200 rpm the sugar charge was forced outward with the molasses flying through the holes in the brass lining. Dried sugar was left behind in the inner basket and was dug out by hand.
- HI-1-25. RW Meyer Sugar Mill: 1876-1889. Centrifugals, 1879, 1881. Manufacturer, Unknown. Supplied by Honolulu Iron Works, Honolulu, Hawaii, 1879, 1881. View: After sugar was granulated and cooled it had to be dried and drained, completely separating the sugar crystals from the molasses. Revolving at 1200 rpm the inner basket drove the molasses outward into the stationary outer basket leaving dried sugar behind. The steam engine countershaft at the left was belt driven and belts running from the countershaft pulleys to the centrifugals' base-pulleys provided the necessary power. Part of the clutch system which moved the belt from a moving to a stationary pulley, thus turning the centrifugals on and off, is seen in between the countershaft and the centrifugals.
- HI-1-26. RW Meyer Sugar Mill: 1876-1889. Centrifugals, 1879, 1881. Manufacturer, unknown. Supplied by Honolulu Ironworks, Honolulu, Hawaii, 1879, 1881. View: Historical view, 1934, from T. T. Waterman collection, Hawaiian Sugar Planters' Association. Once the molasses was separated from the sugar crystals it flowed through the spouts in the base of the centrifugals. The centrifugals' pulleys can be seen underneath the centrifugal. The centrifugal on the right has been reinforced with seven metal bands. The handles for the clutch mechanism are located above the centrifugal.
- HI-1-27. RW Meyer Sugar Mill: 1876-1889. Centrifugals, 1879, 1881. Manufacturer, Unknown. Supplied by Honolulu Ironworks, Honolulu Hawaii, 1879, 1881. View: Historical view, 1934, from T.T. Waterman collection, Hawaiian Sugar Planters' Association. With the inner basket of the centrifugal revolving at 1200 rpm molasses flew outward from the granulated sugar, through the holes in the brass lining, and into the stationary outer basket. The molasses drained through the spout at the right and into molasses storage pits below the floor. The centrifugals were underdriven with a belt connected to the pulley beneath the basket.
- HI-1-28. RW Sugar Mill: 1876-1889. Boiling-range Furnace and Clarifier position; View: In the boiling range all of the clarification, evaporation, and concentration of cane juice took place in open pans over the continuous flue leading from this furnace. The furnace door through the exterior wall is at the end of the furnace. In the original installation, two copper clarifiers, manufactured by John Nott & Co. occupied this space directly above the furnace. In the clarifiers, lime was added to the cane juice

so that impurities would coagulate into a scum on top of the near-boiling juice. The clarifiers have been removed since the closing of the mill.

- HI-I-29. RW Meyer Sugar Mill: 1876-1889. Boiling-range furnace and clarifier position. View: In the boiling range all of the concentration, evaporation, and concentration of cane juice took place in open pans over the continuous flue leaving this furnace. The furnace door through the exterior wall is at the end of the furnace. In the original installation two copper clarifiers, manufactured by John Nott & Co. occupied this space directly above the furnace. In the clarifier lime was added to the cane juice so that impurities would coagulate into a scum on top of the near-boiling juice. The clarifiers have been removed since the closing of the mill.
- HI-I-30. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill: one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1885-1870. View: Masonry-lined passageway leading to the mill at the center of its circular masonry enclosure. The passageway permitted cane to be carried to the mill and cane trash (bagasse) to be carried away. Bridges over the passageways, no longer in place, permitted the mill animals to circle and power the mill from above.
- HI-I-31. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill: one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: View down at the mill from top of the mill's circular masonry enclosure. Mill animals circling above the mill, on top of the enclosure, dragged booms radiating from the drive shaft to power the mill. The drive-shaft is no longer in its upright position but is lying next to the mill in the foreground.
- HI-I-32. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill, one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: End of mill into which cane was fed between top and bottom roll.
- HI-I-33. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill, one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: From above the mill showing the three 15" x 22" horizontal rolls, mill frame or cheeks, portland cement foundation, and lower part of vertical drive shaft lying next mill in foreground. The loose metal piece resting on top of the mill frame matched the indented portion of the upper frame to form a bracket and bearing for the drive shaft when it was in its proper upright position.
- HI-I-34. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill, one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: Side view of mill. Vertical drive shaft lying on ground in foreground. When drive-shaft was in upright position its bevel gear was meshed with the bevel gear of the top roll, transmitting the animals' circular motion around the drive shaft to the horizontal rolls. The foundation

is of portland cement. The heavy timber mill bed, between the mill and the portland cement foundation has rolled away.

- 41-1-35. RW Meyer Sugar Mill: 1876-1889. Three-roll sugar mill, one-ton daily processing capacity. Manufactured by Edwin Maw, Liverpool, England, ca. 1855-1870. View: Bevel gear at lower end of vertical drive shaft in foreground turned bevel gear of top roll when the vertical drive shaft was in place in the brass-bearing socket in the middle ground of the photograph. The bolts above the top roll and at the side of the two bottom rolls adjusted the pressure and position of the rolls' brass bearings.